

Are locomotive styles in primates a driving force behind intra- and interspecies variation in the vertebral column?

Payne, Michelle; Winder, Isabelle C.; Mulley, John

Published: 18/12/2019

[Cyswllt i'r cyhoeddiad / Link to publication](#)

Dyfyniad o'r fersiwn a gyhoeddwyd / Citation for published version (APA):

Payne, M., Winder, I. C., & Mulley, J. (2019). *Are locomotive styles in primates a driving force behind intra- and interspecies variation in the vertebral column?*. Poster session presented at Anatomical Society Winter meeting 2019, United Kingdom.

Hawliau Cyffredinol / General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Are locomotive styles in primates a driving force behind intra- and interspecies variation in the vertebral column?



Michelle Payne, John Mulley and Isabelle Winder

Michelle Payne
bsu596@bangor.ac.uk



Introduction

The vertebral column is made up of five regions (fig 1). In primates and humans, the total number of vertebrae is conserved. However within each region of the vertebral column, the number of vertebrae may vary within and between species. There are also some species who possess more so-called 'transitional' vertebrae, with features of more than one region (fig 2) and located between regions. Despite extensive study, we still do not know why this is or how patterns link to locomotion (fig 3), evolution and development.

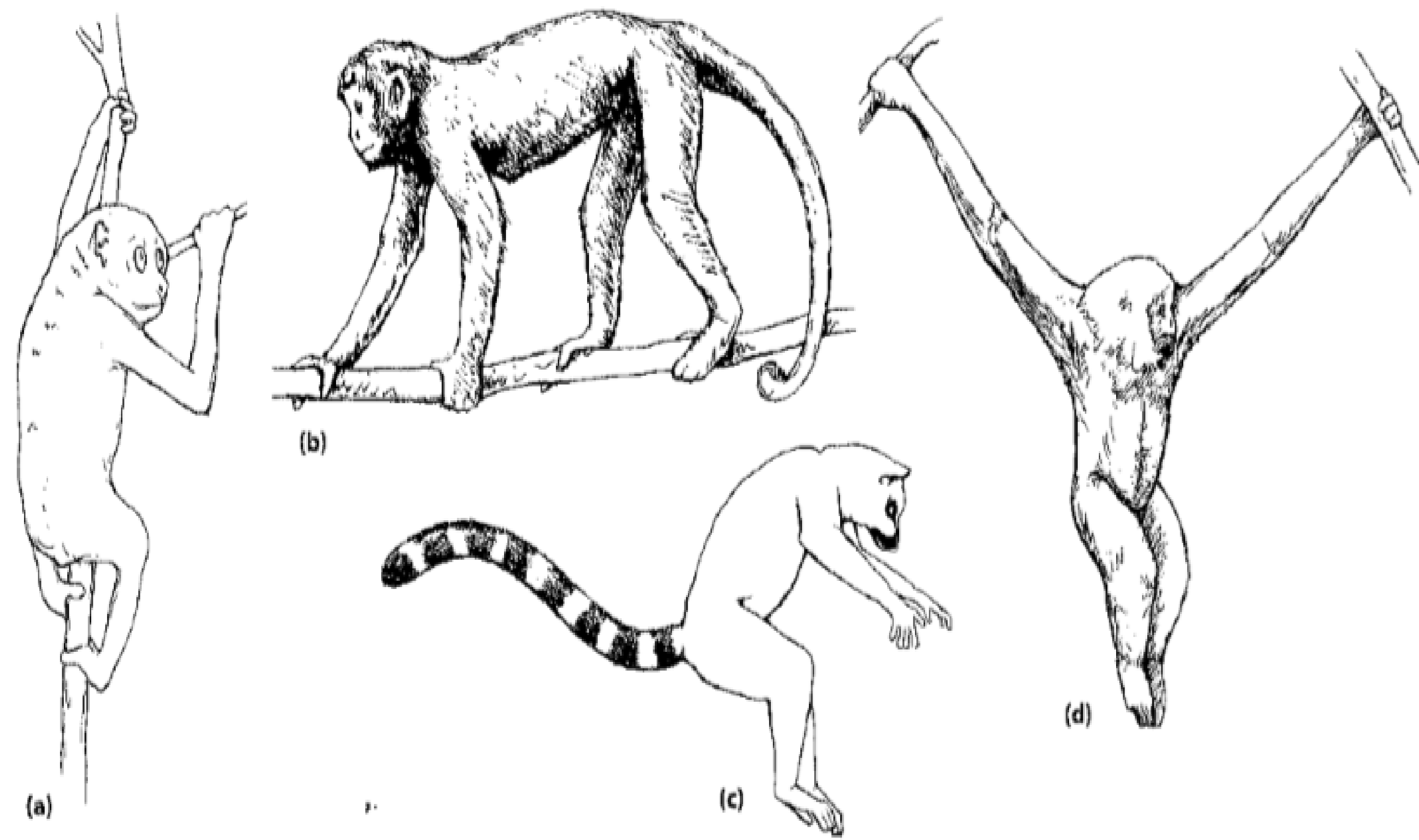


Figure 3: Different types of arboreal locomotion.: a) vertical clinging, b) arboreal quadrupedalism, c) leaping and d) brachiation (Gebo, 2014)

Current knowledge

In the primate's cervical regions, vertebral counts are always the same: seven. However in the other four regions, the thoracic, the lumbar, the sacral and the coccygeal/caudal, there is often more **variation**.

As the other regions are involved in movement and stabilizing the spine, it is possible that **locomotion** is a key aspect of this, especially as primate species use a variety of locomotive styles (fig 3), many species using **arboreal** locomotive styles, while some also or alternatively use **terrestrial** locomotive styles. But could locomotion also explain why variation occurs **within a species** too?

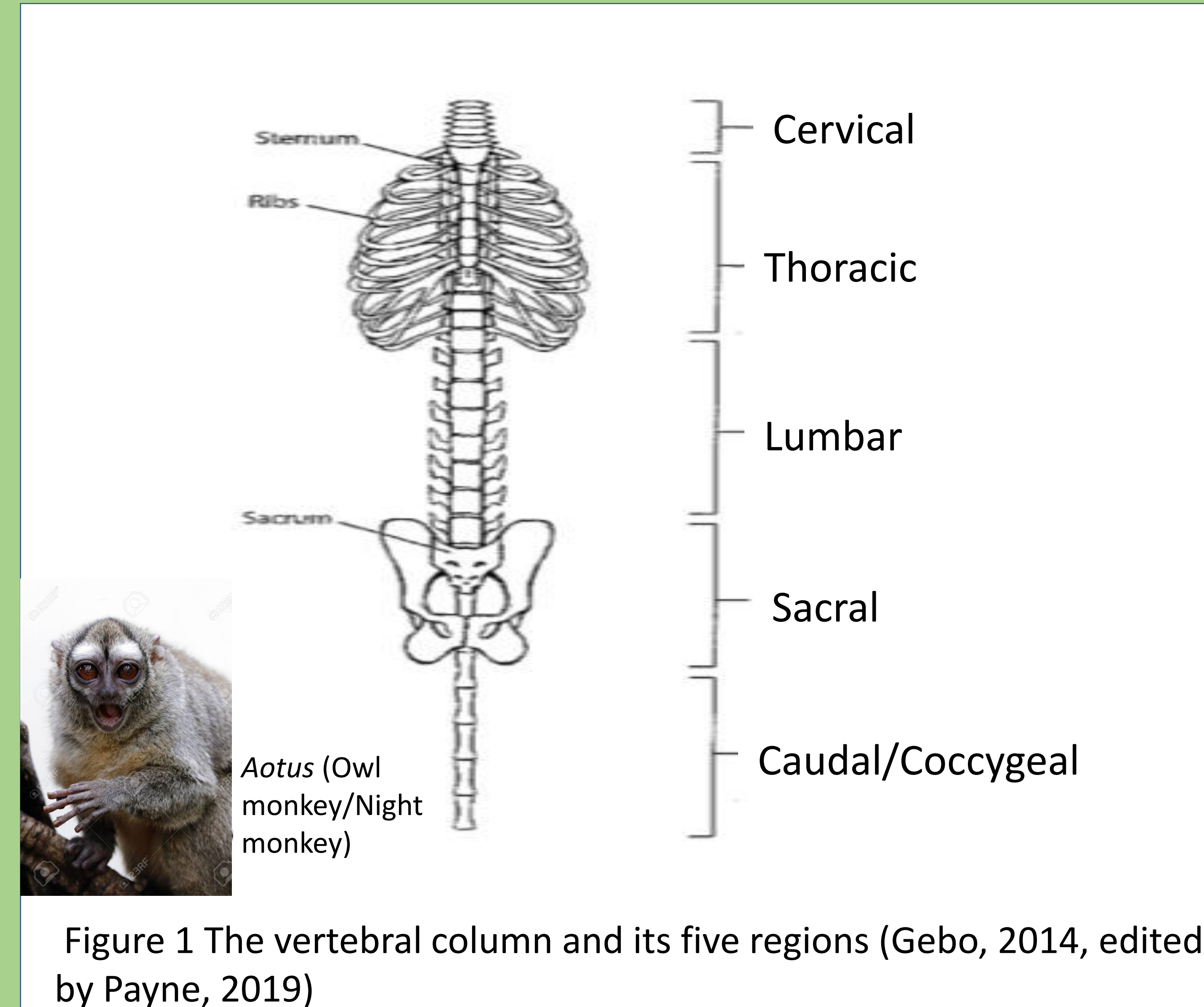


Figure 1 The vertebral column and its five regions (Gebo, 2014, edited by Payne, 2019)

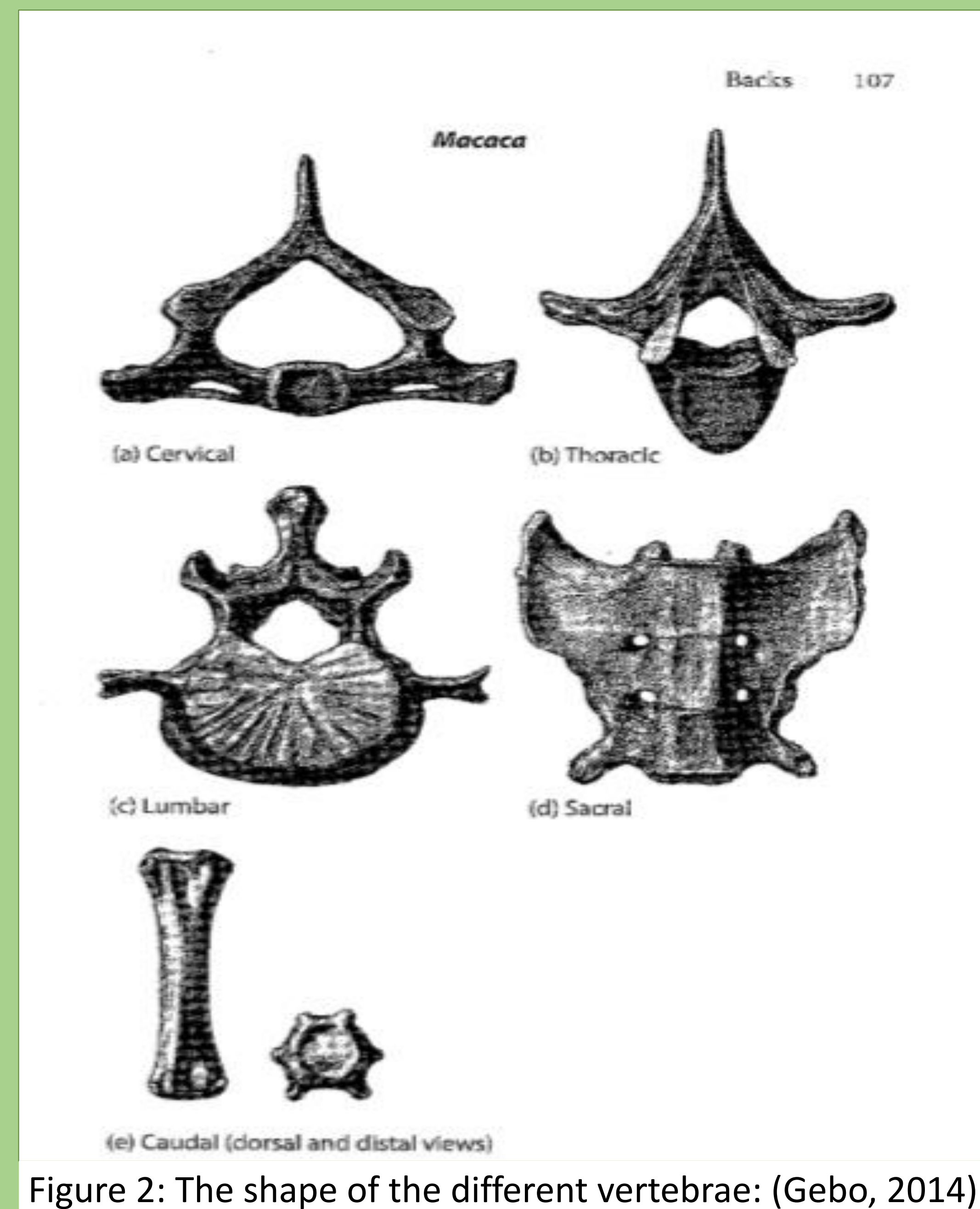


Figure 2: The shape of the different vertebrae: (Gebo, 2014)

Aims and Project outline

For my project, I have collected literature for systematic review and I will be examining different collections of primate vertebral column specimens. I will take count of the number of vertebrae and map out morphometric variation. I aim to see if locomotion is a driving force behind variation and if linked to variation in intraspecies as well as interspecies.

Significance of study

There has been recent studies into why variation occurs, such as when Galis *et.al* (2014), showed that fast mammals have **less stability** in their vertebral columns than slower mammals and Plomp *et.al.* (2015) demonstrated that lumbar vertebrae in humans are shaped **similar to those in chimpanzees**. However, there is still little research into why variation occurs **within a species**.

Other potential drivers for variation:

- Stress and hormonal affect on embryo growth (somites)
- Fusion and transitional intermediate vertebrae
- Changes in the function of one or two regions within the spine

It is also worth mentioning that as humans and great apes have lost their tail, this could be a factor in the variation of this particular region, though it doesn't explain variation in other primates.

Bibliography:

Galis F., Carrier D.R, Alphen J., Mije, S., Van Dooren T.J.M, Metz J.A.J. & Broek, C.M.A., 2014, *Fast running restricts evolutionary change of the vertebral column in mammals*, Proceedings of the National Academy of Sciences of the United States of America, 111 (31), pp. 11401-11406
Gebo, D.L. 2014., *Primate comparative anatomy*. Baltimore : Johns Hopkins University Press.
Plomp, K.A., Viðarsdóttir, U.S., Weston, D.A., Dobney, K., Collard, M., 2015, The ancestral shape hypothesis: an evolutionary explanation for the occurrence of intervertebral disc herniation in humans. *BMC Evol Biol*, 15, 68 doi:10.1186/s12862-015-0336-y